Primary care in the accident and emergency department: II. comparison of general practitioners and hospital doctors

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Abstract

***Objective*—To compare the process and outcome of "primary care" consultations undertaken by senior house officers, registrars, and general practitioners in an accident and emergency department.**

***Design*—Prospective, controlled intervention study.**

***Setting*—A busy, inner city accident and emergency department in south London.**

***Subjects*—Patients treated during a stratified random sample of 419 three hour sessions between June 1989 and May 1990 assessed at nurse triage as presenting with problems that could be treated in a primary care setting. 1702 of these patients were treated by sessionally employed local general practitioners, 2382 by senior house officers, and 557 by registrars.**

***Main outcome measures*—Process variables: laboratory and radiographic investigations, prescriptions, and referrals; outcome variables: results of investigations.**

***Results*—Primary care consultations made by accident and emergency medical staff resulted in greater utilisation of investigative, outpatient, and specialist services than those made by general practitioners. For example, the odds ratios for patients receiving radiography were 2·78 (95% confidence interval 2·32 to 3·34) for senior house officer *v* general practitioner consultations and 2·37 (1·84 to 3·06) for registrars *v* general practitioners. For referral to hospital specialist on call teams or outpatient departments *v* discharge to the community the odds ratios were 2·88 (2·39 to 3·47) for senior house officers *v* general practitioners and 2·57 (1·98 to 3·35) for registrars *v* general practitioners.**

***Conclusion*—Employing general practitioners in accident and emergency departments to manage patients with primary care needs seems to result in reduced rates of investigations, prescriptions, and referrals. This suggests important benefits in terms of resource utilisation, but the impact on patient outcome and satisfaction needs to be considered further.**

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Introduction

As reported in the accompanying paper, nurse triage assessment in the accident and emergency department can be modified to include classification of patients' presentations into "primary care" and "accident and emergency" categories.[1] At King's College Hospital this resulted in 41% of new attenders being classified as presenting with primary care problems suitable for management by a general practitioner.[1] However, 10% of primary care patients were referred to on call specialist teams and a further 9% were referred to the fracture clinic or advised to return to the accident and emergency department for follow up.

The implementation of this modified system of triage provided an opportunity for undertaking a prospective, controlled intervention study of the relation between training and experience of the consulting doctor and the consultation process and outcome. The purpose of the study was to explore the effect of general practitioners treating patients identified by nurse triage as presenting with primary care problems. In this paper, the impact on the process of care is considered; a subsequent paper will describe the impact on clinical outcome and patient satisfaction.

Method

The study was carried out in the accident and emergency department at King's College Hospital, London, between 1 June 1989 and 31 May 1990. Bank holidays and the first two weeks of August and February (when accident and emergency staff change) were excluded. A total of 27 senior house officers, three registrars, and one senior registrar were employed in the department during this period, and all were included in the study.

Vocationally trained local general practitioners were recruited to work "primary care" sessions in the department. Preference was given, firstly to those who had recently completed training (that is, general practitioners registered for similar numbers of years to the accident and emergency doctors) and, secondly, to those with flexible hours of availability. Eleven general practitioners applied, and six were appointed; two left during the study and were replaced. They received honorary health authority contracts and so had access to the full range of hospital services. Each was employed to work one or two three hour primary care sessions a week.

A random sample of sessions stratified by time of day and day of week was determined by using a table of random numbers. General practitioners and accident and emergency medical staff were considered as two groups, and each group was allocated two or three weekday sessions running from 1000 to 1300 and 1400 to 1700, one weekday evening session from 1800 to 2100, and one weekend daytime sessions for each week during the study period. Hence, 8-10 sessions were sampled each week for a total of 48 weeks. The sample of sessions allocated to accident and emergency staff was the same as those described in the accompanying paper.[1] Throughout the study period weekly rosters stipulated a named doctor with responsibility for primary care patients for every three hour session between 1000 and 2100. Neither the general practitioners nor the accident and emergency doctors or nurses were informed about the study objectives or whether any particular session was part of the study sample.

The criteria and method used to assess patients at nurse triage have been described.[1] The triage system included the allocation of patients into primary care and accident and emergency categories and operated around the clock to ensure consistency of practice. The patient sample consisted of all those who were assessed as presenting with new primary care needs and who were treated during the selected sessions. Patients were unaware of their triage status or the grade and specialty of their doctor. Occasionally, such as when the department was exceptionally busy, the triage status of patients was not recorded, and in such instances patients were excluded from the sample. This was unlikely to happen when general practitioners were

present, since their work depended on being provided with patients assessed by triage as presenting with primary care needs.

Although the intention was that all primary care patients would be treated by the allocated doctor, this did not always occur. Firstly, at times when the primary care workload was excessive, other doctors were directed by the nurse performing triage to treat primary care patients to prevent unacceptably long waiting periods from occurring; secondly, registrars in particular were often interrupted from completing primary care sessions by departmental circumstances (such as responding to patients with urgent or life threatening needs or providing advice or supervision to senior house officers). Hence patients were sometimes attended by a non-allocated doctor, both during sessions originally allocated to a general practitioner and during those allocated to another member of accident and emergency staff. Since this breakdown of randomisation was not always clearly documented, data for all recorded primary care consultations occurring during the selected sessions were included in the sample, and data on patients were regrouped according to the type of doctor actually seen. The loss of randomisation was allowed for by including confounding factors in the analysis of the data.

To control the environment in which consultations took place, a consulting room was designated and equipped for primary care consultations, and the doctor assigned for primary care was encouraged to use it. Throughout the study period, all doctors using the primary care consulting room were asked to complete a consultation record form for each patient seen. This form facilitated data collection through ensuring that sociodemographic details, investigations, treatments, and referrals were recorded. It was not possible to arrange for doctors treating patients in other parts of the department to use this form. Doctors remained blind to how data from these forms would be analysed.

PROCESS DATA

Primary care patients treated during sampled sessions were identified from the accident and emergency register and data were obtained from records and consultation record forms. Explanatory variables included the consulting doctor; patient's age, sex, occupational class, postcode, general practitioner, diagnosis (coded using the Royal College of General Practitioners' classification system[2] up to the fifth digit, and then recoded according to chapter headings), and previous care given for the presenting problem.

Process variables included the doctor's use of radiology, haematology, chemical pathology, and microbiology investigations; items prescribed (for patients not referred to on call teams); and referral and discharge decisions made by the doctor. Data on the results of investigations were obtained from laboratory and radiology reports.

ANALYSIS

Data were analysed using the SPSS-X and BMDP statistical packages. Statistical analyses consisted of the Kruskal-Wallis test to compare the distribution of continuous variables between groups; χ^2 tests to investigate associations between pairs of categorical variables; and log-linear model analysis to estimate associations between more than two categorical variables. The best fitting log-linear models were found by first fitting all models of uniform order and then removing terms from the least well fitting model by backwards elimination.[3] The goodness of fit of log-linear models was tested by using the likelihood ratio χ^2 statistic, G.[2] A 1% level of significance was used for exploratory tests and 5% for log-linear modelling.

TABLE I—*Characteristics of primary care attenders included in sample*

	No (%) of patients
Age in years (n=4641):	
0-5	416 (9·0)
6-16	497 (10·7)
17-20	426 (9·2)
21-25	839 (18·1)
26-30	666 (14·4)
31-50	1076 (23·2)
51-60	312 (6·7)
>60	409 (8·8)
Social class (n=1637):	
I	33 (2·0)
II	293 (17·9)
III Non-manual	313 (19·1)
III Manual	377 (23·0)
IV	174 (10·6)
V	135 (8·2)
Unemployed	312 (19·1)
Sex (n=4627):	
Female	2192 (47·4)
Male	2435 (52·6)

Results

The final sample consisted of 4641 primary care patients seen during 419 sessions, of which 215 had been allocated to general practitioners and 204 to accident and emergency staff. A total of 1702 patients were seen by general practitioners, 2382 by senior house officers, and 557 by registrars or the senior registrar (treated in the analysis as a single group and hereafter described as registrars). This distribution of patients reflected the extent to which accident and emergency staff provided cover to the allocated doctor (both general practitioners and other accident and emergency staff) during sessions when the primary care workload was particularly busy. (The number of patients seen by accident and emergency staff is larger than that described in the accompanying paper[1] because that study was not concerned with any consultations that occurred during sessions allocated to general practitioners.)

Not all records were complete; percentages given below refer to proportions of patients for whom data were retrieved. Table I gives characteristics of the patients included in the sample, and table II shows the duration, previous care, and diagnoses of the problems presented. Table III shows the numbers of patients receiving investigations, prescriptions and referrals. The association between the doctor seen (general practitioner, senior house officer, or registrar) and the main consultation process variables was investigated by χ^2 analysis (table IV). All the process variables showed a significant association with the type of doctor seen, with the largest effect sizes being for radiographic investigations and for referral after discharge. General practitioners

TABLE II—*Duration, previous primary care, and diagnoses of problems presented by primary care attenders at accident and emergency department*

	No (%) of patients
Duration of problem (n=4320):	
<6 Hours	662 (15·3)
6-24 Hours	969 (22·4)
1-7 Days	1685 (39·0)
>7 Days	1004 (23·2)
Previous primary care contact (n=3623):	
General practitioner	753 (20·8)
Other	106 (2·9)
None	2764 (76·3)
Diagnosis (n=4641):	
Infectious and parasitic diseases	229 (4·9)
Endocrine and metabolic diseases	42 (0·9)
Mental disorders	93 (2·0)
Diseases of nervous system	46 (1·0)
Diseases of eye	145 (3·1)
Diseases of ear	127 (2·7)
Cardiovascular and peripheral vascular diseases	67 (1·4)
Respiratory system diseases	302 (6·5)
Digestive system diseases	273 (5·9)
Genitourinary system diseases	254 (5·5)
Complications of pregnancy, childbirth, contraception	89 (1·9)
Diseases of skin and subcutaneous tissue	289 (6·2)
Diseases of musculoskeletal system	634 (13·7)
Non-specific symptoms, signs	326 (7·0)
Injury and poisoning	2061 (44·4)
Social, marital, and family problems	48 (1·0)

TABLE III—*Investigations, prescriptions, and referrals received by patients*

	No (%) of patients
Radiography (n=4606)	966 (21·0)
Haematology (n=4624)	125 (2·7)
Chemical pathology (n=4621)	88 (1·9)
Microbiology (n=4618)	143 (3·1)
Electrocardiography (n=4620)	92 (2·0)
Prescription (one or more items) (n=4242*)	1800 (42·4)
Referral (n=4566):	
Community or general practice	3676 (80·5)
On call specialist team	376 (8·2)
Outpatient clinic	289 (6·3)
Return to accident and emergency	225 (4·9)

*Excludes patients referred to on call teams.

TABLE IV—*Type of doctor seen by patients receiving investigations, prescriptions, and referrals. Values are numbers (percentages)*

	Type of doctor seen				
	General practitioner (n=1702)	Senior house officer (n=2382)	Registrar (n=557)	χ^2 (df)	P value
Radiography	207 (12·2)	619 (26·2)	140 (25·4)	123·7 (2)	<0·001
Haematology	14 (0·8)	106 (4·5)	5 (0·9)	57·9 (2)	<0·001
Chemical pathology	10 (0·6)	71 (3·0)	7 (1·3)	32·2 (2)	<0·001
Microbiology	35 (2·1)	99 (4·2)	9 (1·6)	19·4 (2)	<0·001
Electrocardiography	21 (1·2)	64 (2·7)	7 (1·3)	12·6 (2)	0·002
Prescription*	640 (39·7)	921 (43·6)	239 (46·5)	9·7 (2)	0·008
Referral to:					
Community or general practice	1509 (89·5)	1741 (74·6)	426 (78·0)	155·9 (6)	<0·001
On call specialist team	84 (5·0)	253 (10·8)	39 (7·1)		
Outpatient clinic	66 (3·9)	175 (7·5)	48 (8·8)		
Accident and emergency	27 (1·6)	165 (7·1)	33 (6·0)		

Data not available for all patients.
*Excludes patients referred to on call specialist teams.

TABLE V—*Type of doctor seen by patients prescribed drugs. Values are numbers (percentages)*

	Type of doctor seen				
	General practitioner (n=1617)	Senior house officer (n=2130)	Registrar (n=518)	χ^2 (df=2)	P value
Analgesics	156 (9·6)	278 (13·1)	72 (13·9)	12·5	0·002
Antibiotics	265 (16·4)	448 (21·0)	112 (21·6)	14·7	<0·001
Non-steroidal anti-inflammatory drugs	106 (6·6)	185 (8·7)	54 (10·4)	9·9	0·007

Data not available for all patients.

TABLE VI—*Associations between doctor seen and explanatory variables. (Only those for which P<0·1 are included. Values are numbers (percentages))*

	Type of doctor seen				
	General practitioner (n=1702)	Senior house officer (n=2382)	Registrar (n=557)	χ^2 (df)	P value
Age:					
0-5	108 (6·3)	267 (11·2)	41 (7·4)	64·7 (14)	<0·001
6-16	150 (8·8)	276 (11·6)	71 (12·7)		
17-20	171 (10·0)	204 (8·6)	51 (9·2)		
21-25	329 (19·3)	415 (17·4)	95 (17·1)		
26-30	257 (15·1)	327 (13·7)	82 (14·7)		
31-50	405 (23·8)	535 (22·5)	136 (24·4)		
51-60	135 (7·9)	129 (5·4)	48 (8·6)		
>60	147 (8·6)	229 (9·6)	33 (5·9)		
Diagnosis:					
Mental disorders	49 (2·9)	34 (1·4)	10 (1·8)	10·8 (2)	0·004
Diseases of nervous system	11 (0·6)	32 (1·3)	3 (0·5)	6·2 (2)	0·044
Diseases of skin and subcutaneous tissue	129 (7·6)	128 (5·4)	32 (5·7)	8·5 (2)	0·014
Non-specific symptoms, signs	106 (6·2)	187 (7·9)	33 (5·9)	5·2 (2)	0·075
Injury and poisoning	748 (43·9)	1028 (43·2)	285 (51·2)	12·0 (2)	0·002

Data not available for all patients.

TABLE VII—*Goodness of fit of log-linear models comprising all two way interaction terms for the following variables: type of doctor seen, age of patient, injury related diagnosis, and stated process variable*

Process variable	G^2	df	P value
Radiography	61·74	51	0·14
Haematology	37·70	51	0·92
Chemical pathology	50·10	51	0·51
Microbiology	48·83	51	0·56
Electrocardiography	53·10	51	0·39
Prescription (any *v* none)	58·29	51	0·23
Referral (community or general practitioner *v* other)	47·71	51	0·61

TABLE VIII—*Odds ratios (95% confidence intervals) from the best fitting log-linear models for each process variable against "doctor seen" variable*

	Senior house officer *v* general practitioner	Registrar *v* general practitioner
Radiographic investigation *v* none	2·78 (2·32 to 3·34)	2·37 (1·84 to 3·06)
Haematology investigation *v* none	6·17 (3·46 to 10·97)	1·32 (0·46 to 3·77)
Chemical pathology test *v* none	5·71 (2·89 to 11·30)	2·63 (0·97 to 7·12)
Microbiology test *v* none	2·10 (1·40 to 3·14)	0·89 (0·42 to 1·89)
Electrocardiography *v* none	2·38 (1·42 to 3·98)	1·25 (0·51 to 3·04)
Prescription *v* none*	1·28 (1·11 to 1·47)	1·54 (1·24 to 1·91)
Referral to hospital *v* to community or general practitioner	2·88 (2·39 to 3·47)	2·57 (1·98 to 3·35)

*Excludes patients referred to on call specialist teams.

also sent significantly fewer patients for haematology, clinical pathology, and microbiology investigations.

Overall, 304 patients (6·6% of the study sample) were diagnosed as having fractures, of whom 160 had fractures affecting toes, ribs, or the nose. Most of the remaining fractures were of the hand or foot; none were compound or needed fixation. Despite the differences in the frequency of radiographic investigation, 102 (6·0%) patients seen by general practitioners and 150 (6·3%) seen by senior house officers were identified as having fractures. The registrars identified a slightly greater proportion (9·3%) of patients as having a fracture, and this is consistent with the greater proportion of injury related problems in their case mix (see below).

With the exclusion of patients referred to on call teams, fewer of the patients who saw general practitioners were issued with prescriptions (table IV). The mean numbers of items prescribed also varied with doctor seen: for general practitioners, 0·46; senior house officers, 0·57; registrars, 0·63 (Kruskal-Wallis $\chi^2=20·66$, $P<0·001$). The differences in prescribing were largely accounted for by more frequent prescribing of antibiotics, analgesics, and non-steroidal anti-inflammatory drugs by senior house officers and registrars (table V). The odds ratios for prescription of antibiotics were 0·74 (0·62 to 0·87) for general practitioners versus senior house officers and 0·71 (0·56 to 0·91) for general practitioners versus registrars; for prescriptions of analgesics, the odds ratios were 0·71 (0·58 to 0·88) and 0·66 (0·49 to 0·89) respectively.

LOG-LINEAR MODELLING

To check for any confounding factors that may be influencing these differences, we used χ^2 analysis to investigate possible associations between the doctor seen and the main explanatory variables recorded (table VI). Two variables—age and an injury related diagnosis—were found to vary significantly with type of doctor seen. In addition, other variables (such as diagnosis of a mental disorder or a disease of the skin) varied significantly but had small effect sizes. Age and an injury related diagnosis were also related to the process variables. Therefore we investigated the relation between the various process variables and doctor seen, allowing for these two possible confounding factors, with log-linear models. For all seven process variables, the best fitting model of "uniform order" was found to be the one containing all the interactions between pairs of variables (table VII; $P>0·05$ indicates that the model fits well). In all seven cases, no further terms could be removed from the model without significant loss of fit, and so the models described in table VII were accepted as the best fitting. From these models it is apparent that each pair of variables is associated, and that these associations are in each case independent of any third variable since no three way interactions are present. Hence the relation between each of the process variables and the doctor seen does not seem to be influenced by any differences in the distribution of age or injury related diagnosis.

Table VIII presents odds ratios resulting from the fitted log-linear models. For example, the odds ratios of being sent for radiography if seen by a senior house officer compared with being seen by a general practitioner were 2·78 and for a registrar versus a general practitioner were 2·37. The odds ratios of being referred to a hospital based service (including on call teams and outpatient clinics) were 2·88 if the patient was seen by a senior house officer versus a general practitioner and 2·57 for a registrar versus a general practitioner.

Key messages

- In the provision of primary care in an accident and emergency department, considerable differences exist between the consultation practice of general practitioners, senior house officers, and registrars
- Senior house officer and registrar consultations involve considerably greater utilisation of hospital investigative and specialist resources
- Benefits may follow from employing general practitioners as primary care physicians in accident and emergency departments
- The impact of these differential rates of investigations and referrals on clinical outcome and patient satisfaction needs consideration
- More emphasis should be placed on training accident and emergency doctors to develop their assessment and consultation skills for primary care management

Discussion

This is the first study to undertake a prospective, controlled trial comparing consultations made by general practitioners and hospital doctors within a hospital accident and emergency setting. Primary care consultations made by accident and emergency medical staff resulted in considerably greater utilisation of hospital investigative and specialist resources than those made by sessionally employed general practitioners.

For radiographic investigation, prescribing, and referrals, the odds ratios for senior house officers compared with general practitioners were similar to those for registrars compared with general practitioners. This suggests that length of clinical experience alone does not explain the observed differences in doctors' rates of investigation or referral. Furthermore, the general practitioners in this study had been registered as medical practitioners for a similar number of years to the registrar group. Although all staff involved in the study were expected to be familiar with the accident and emergency department's guidelines for patient management, which include indications for investigation and referral, it seems that the interpretation and application of these guidelines varied.

While other studies in accident and emergency settings have looked at consultation activities and outcomes, and from these sought to derive patients' presenting needs, the strength of the current study is that it was based on a prospective design. However, there are several methodological issues which need consideration.

METHODOLOGICAL CONSIDERATIONS

Firstly, a rigorously controlled trial was precluded by unavoidable constraints operating within a busy accident and emergency department. These included the need for staff to respond without delay to life threatening emergencies; unpredictable variations in workload; and the necessity to keep waiting times to a minimum. The best that could be achieved was a stratified random allocation of doctors to different times of the day and week throughout the study period, with log linear model analysis to control for the loss of randomisation that occurred owing to variations from this.

Secondly, the general practitioners in this study were supernumerary to regular accident and emergency staffing. As a result there were differences in waiting times for consultation when general practitioners were or were not working sessions. When the general practitioners were present, patient throughput tended to increase and waiting times decline, and in consequence the numbers of primary care patients obtained from sessions allocated to general practitioners were slightly greater than from sessions allocated to accident and emergency staff. Furthermore, the general practitioners worked sessions of only three hours in accident and emergency, compared with senior house officers' and registrars' shifts of up to 11 hours. Duration of shift may affect attitudes to patient care and influence the threshold for initiating referral or investigation; this could not be controlled for within the study.

Thirdly, the study was conducted in an inner city teaching hospital, and so there is a need to be circumspect in considering its applicability to other accident and emergency settings. In addition, the doctors studied included only eight general practitioners, three registrars, and one senior registrar. For the registrar-senior registrar group in particular, the findings need to be interpreted cautiously. However, the results are consistent with other work, including Noren's comparison of internists and family physicians in the United States.[4]

Finally, the results of this study describe the average effects of being seen by a general practitioner, senior house officer, or registrar. An aspect not considered in the analysis of data was variation between the individual doctors within each group. This is an issue which requires further study and is likely to have implications for staff recruitment and training.

CONCLUSION

Accident and emergency departments, like general practice, have a gatekeeping role at the interface between hospital and community based services.[15] The stressful and hectic environment that characterises accident and emergency departments is likely to make the provision of quality primary care difficult to achieve. The results of this study suggest important resource implications that may follow from the employment of general practitioners to treat patients identified as presenting to accident and emergency with primary care problems. This may offer a means of reducing rates of referrals, investigations, and treatments; through achieving more community oriented provision, it should enable greater integration of the care provided by hospital and community based health services. The effect this has on patient satisfaction and clinical outcome will be discussed in a subsequent paper.

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